MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

EEL1166 – CIRCUIT THEORY

(All sections / Groups)

11 OCTOBER 2016
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FIVE** pages including cover page with **FOUR** questions only.

2. Answer **ALL** questions and print all your answers in the answer booklet provided.

3. All questions carry equal marks and the distribution of the marks for each question is given.

Question 1

a) Discuss the difference between passive and active elements and provide examples of those elements.

[3 marks]

b) For the circuit shown in Figure Q1(b), find the current i using the principle of superposition.

[10 marks]

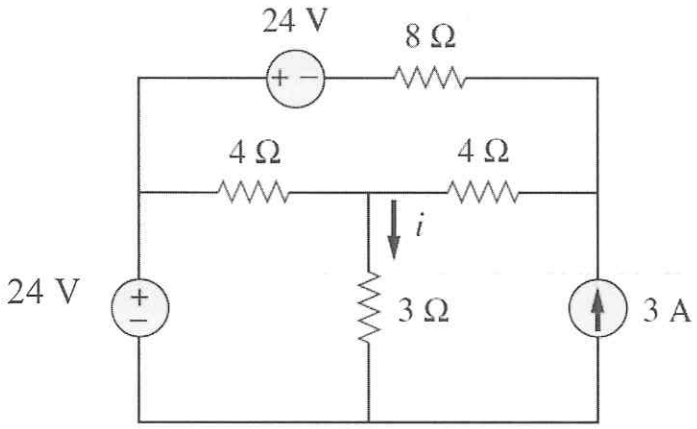

Figure Q1 (b)

c) For the circuit shown in Figure Q1(c), find the following:

i. The Thevenin voltage V_{th} across the terminals a and b.

[8 marks]

ii. The load resistor value, R_L, at the maximum power transfer in the circuit.

[1 mark]

iii. The maximum power.

[3 marks]

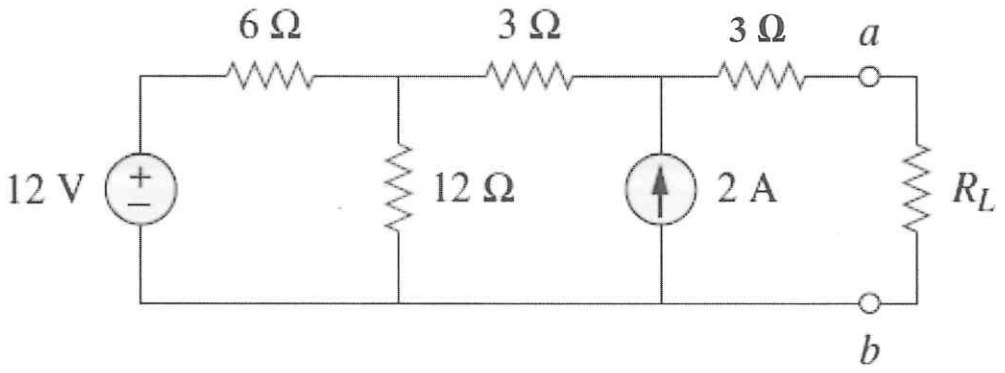

Figure Q1(c)

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Question 2

a) For the circuit shown in Figure Q2(a), find i_o, using mesh analysis.

[13 marks]

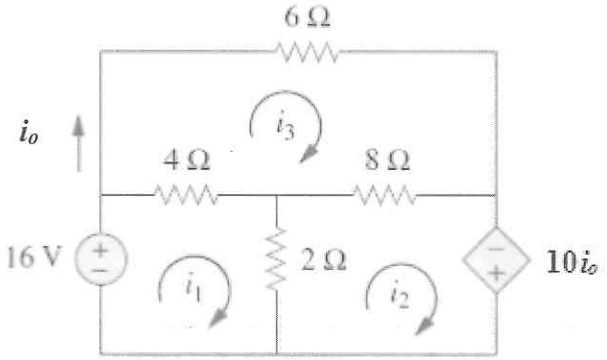

Figure 2(a)

(b) Consider the signal X defined by the equations:

$$X(t) = \begin{cases} 4, & 0 < t \le 2 \\ 2t, & 2 < t \le 3 \\ 9 - t, & 3 < t \le 5 \end{cases} \text{ and } X(t) = X(t-5)$$

(i) What is the period of X? [1 mark]

(ii) Determine the average value of X. [4 marks]

(iii) Determine the root-mean-square value of X. [4 marks]

(iv) Calculate the form factor and crest factor of X. [1 + 2 marks]

Question 3

(a) Resonance occurs in any circuit that has at least one inductor and one capacitor. State two (2) characteristics of an RLC circuit during resonance. What value of ω will cause the circuit of Figure 3(a) to be in resonance?

[2+2 marks]

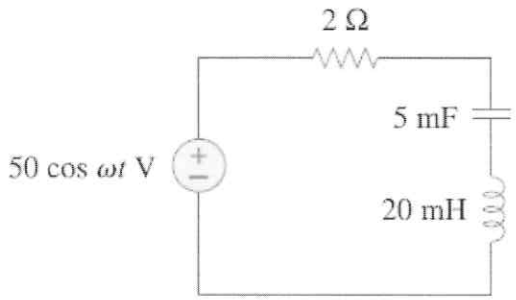

Figure 3(a)

Continued...

(b) For the circuit shown in Figure 3(b), find the quality factor, Q and the bandwidth, B.

[5 marks]

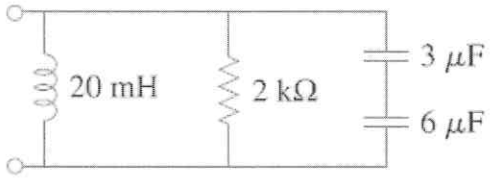

Figure 3(b)

(c) In Figure 3(c), an input voltage source of $v_s = 60\cos(200t - 10°)$ V is driving an RLC circuit.

(i) Determine the total impedance at the source of the circuit. [7 marks]
(ii) Find the current *i*. [3 marks]
(iii) Determine the power factor. Is it lagging or leading? [3 marks]
(iv) Calculate the average power delivered by the source. [3 marks]

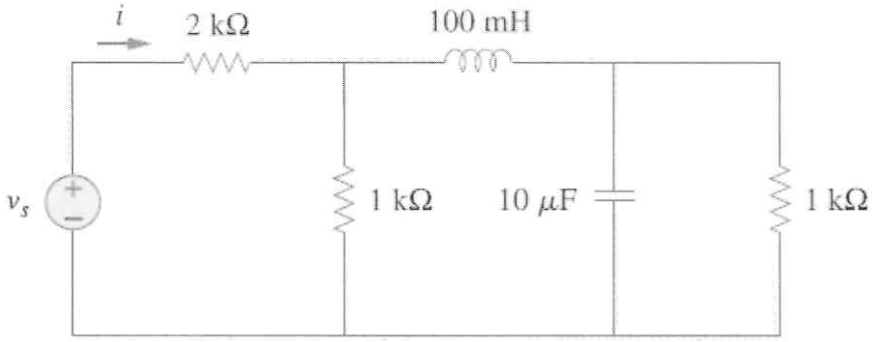

Figure 3(c)

Continued...

Question 4

(a) The RC transient circuit is shown in Fig. Q4 (a).The capacitor in the figure Q4 (a) has an initial voltage of 4V, the R_1= 3.3 kΩ, R_2=10kΩ and C=10μF. Determine the followings:

(i) Find the mathematical expression for the voltage across the capacitor when the switch is closed at $t = 0$.

[8 marks]

(ii) Find the mathematical expression of the current during the transient period.

[5 marks]

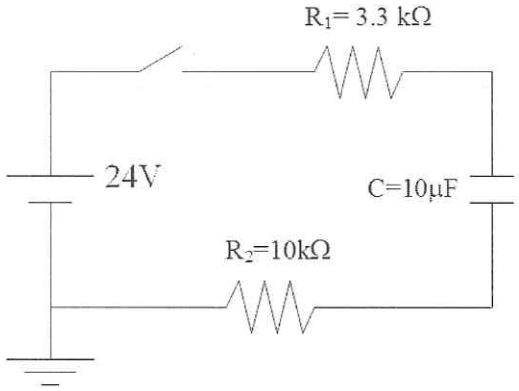

Figure Q4 (a)

(b) The source-free RLC circuit is shown in Fig. Q4 (b). The capacitor C=0.2μF is charged to 100V. At t=0 the capacitor is discharged through a series combination of a 150mH and a 560 Ω resistor.

(i) Find i(t) for t≥ 0.

[8 marks]

(ii) Find v_c(t) for t≥ 0.

[4 marks]

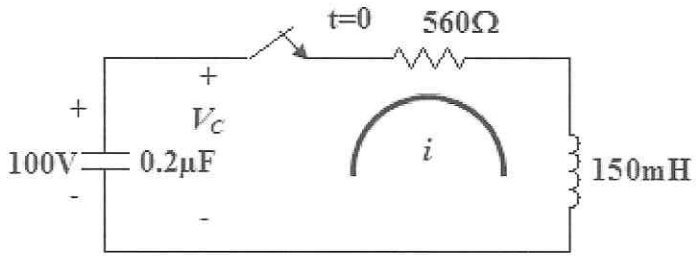

Fig. Q4 (b)

End of Paper